

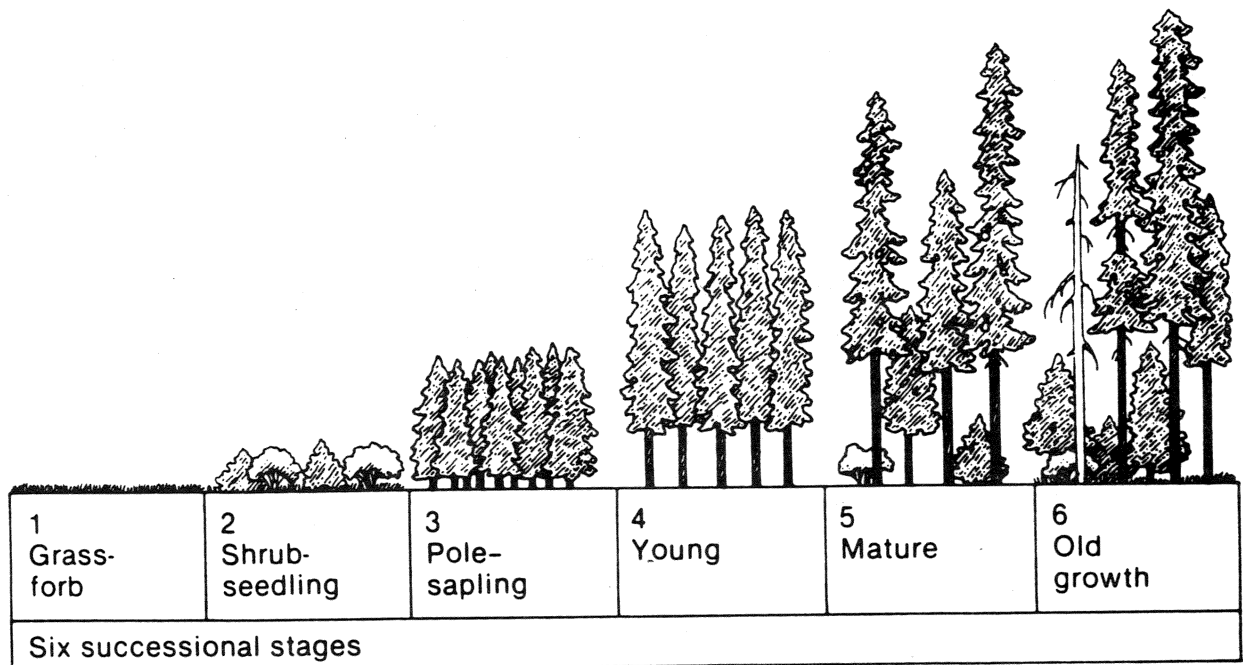
In Western Washington, successional stages involve a sequence of changing relationships among coexisting plants. Recruitment of new species occurs, if at all, for a relatively short period. Typically, little recruitment of trees in forest stands occurs 20 years after stand initiation.

There are four, distinct forest developmental stages: stand initiation, stem exclusion, understory reinitiation and old growth. Each stage represents changes in dominance relationships among more or less continuously existing plant species.

Considerable diversity exists when the state as a whole is used as the frame of reference. Viewed from that perspective, there is a patchwork of communities on state forest land that differ in age, species composition and succession stage. **Figure 4** shows the successional stages of flora.

The forests on department-managed land are regenerated with native species, typically by a combination of planting and natural seeding from adjacent trees or residual seeds on the site. It is rare to have a stand of state forest land that is composed of just one species. Understory vegetation is aggressive in Western Washington and rapidly invades any opening in the forest canopy. Harvested areas are no exception. Ferns, wildflowers, berries and a wide variety of herbaceous and woody plants occupy all available growing space in each stage of forest development. Each of these plants plays a role in the habitat, soil development and the ever-changing community within the forest ecosystem. The forest is never static.

**FIGURE 4**  
Successional Stages



Source: Thomas et al., 1979.

## 2. Types of Vegetation

Washington vegetation is classified into four types:

a. Moist conifer forests. These forests are found in coastal western British Columbia, Washington and Oregon. Conifer species overwhelmingly dominate the vegetation. Wet, mild winters; warm, relatively dry summers; massive tree structure; long life and efficient growth give the Northwest coastal conifer forests a net productivity superior to most temperate forests in other regions of the world, and approaches that of tropical forests. Northwestern tree species continue to grow substantially (in diameter, height and biomass) long after trees in other temperate regions have stopped.

b. Treeless alpine areas. These areas in the Olympic and Cascade Mountains are restricted to high altitudes. Cold temperatures, deep snow packs and extremely short growing seasons restrict development of tree cover; even soil development suffers. The alpine areas meld into forests at lower elevations, first forming dwarf forests on protected sites. Groups of trees then spread at lower elevations to form enclosed glades which eventually become continuous forests.

c. Interior conifer forests of Eastern Washington. These forests, which are found east of the Cascades, are westward extensions of Rocky Mountain coniferous forests. Occasional coastal elements also extend over the Cascade crest and persist on favorable sites in certain portions of Eastern Washington and northern Idaho. They respond to greater moisture stress by slower growth relative to forests west of the Cascades.

d. Treeless steppe areas. These regions, the treeless plains of the Columbia Basin and eastern Cascade foothills, are found in the rain shadow of the Cascade Mountains. Vegetation there is adapted to low rainfall and high evaporative stress.

Included in these zones are also small amounts of wetlands, which are often rich in species and diversity. They may contain special species limited to that particular environment.

Each of these four types can be subdivided into vegetative zones, which are characterized and named by a particular tree or plant species present at climax.

### 3. Vegetative Zones

**Table 27** shows the major vegetative zones within each physiographic province. This table, compiled by the U.S. Forest Service, is meant to illustrate the variety of tree, shrub and other vegetation found in Washington State, and is not intended to be a complete list. The zones are described in more detail in the following paragraphs.

#### a. Sitka Spruce Zone

Along the Pacific coast and extending inland up river valleys is a narrow band of vegetation where Sitka spruce is considered climax. This is the Sitka spruce zone. It is usually only a few miles wide and occurs where summer fog and drip precipitation are common. This climate is the mildest of any Washington forest zone. Winter rains are heavy, and snow is infrequent. Trees in this zone are tall and stands are dense. Productivity and biomass are high, and there are relatively few hardwoods. Rain forests of the Olympic National Park can also be described as a special type of Sitka spruce zone.

#### b. Western Hemlock Zone

The Western hemlock zone extends from sea level to 2,000 feet throughout most of Washington. The inland boundary of this zone coincides roughly with the western boundary of the National Forests in the Cascade Mountains.  
zone.

The climax trees are Western hemlock, with Western redcedar in moister areas and Douglas-fir in drier areas. This zone is the largest forest type in the state and contains some of the most productive and most highly managed forest lands. Because of its extent and accessibility, most of the Western hemlock zone has been disturbed, logged or burned at least once in the past 100 to 200 years. As a result, large portions are now dominated by Douglas-fir in seral stands or contain mixtures of hardwoods.

Even before settlement by Europeans, there were extensive Douglas-fir stands, probably the result of old fires. Remnants of these original stands are commonly referred to as old growth stands. Red alder is a common pioneer species throughout the Climate of the Western hemlock zone is mild, wet and maritime. Snow is common but not persistent. The forest is a canopy of dense, tall conifers. The Puget Sound lowland province is considered a special type, with forest composition modified by the rain shadow of the Olympic Mountains and gravelly glacial soils.

Most state forest land in Western Washington is in this zone.

**TABLE 27**  
**Vegetative Zones**

Physiographic Province	Vegetative Zone	Elevation Range	Average Precipitation	Major tree species	Dominant Shrub Communities	Grass, Forb or Herbaceous
<b>Olympic Peninsula</b>	sitka spruce	0-500'	75-120"	sitka spruce, western hemlock, western redcedar, Douglas fir	salmonberry, elderberry	sword fern, yellow skunk cabbage
	hemlock	0-3,250'	60-120"	Douglas fir, western hemlock, western redcedar, red alder	vine maple, Pacific rhododendron, salal, red huckleberry	sword fern, Oregon oxalix, twin-flower
	subalpine	2,000-7,250'	no data	mountain hemlock, noble fir, Shasta red fir, Pacific silver fir, western white pine.	huckleberry species, rhododendron, dogwood, gooseberry, several blackberries	beargrass evergreen, violet hawkweed
<b>Willapa Hills</b>	sitka spruce	0-500'	75-120"	sitka spruce, western hemlock, western redcedar, Douglas fir	salmonberry, elderberry	sword fern, yellow skunk cabbage
	hemlock	0-3,250'	60-120"	Douglas fir, western hemlock, western redcedar, red alder	vine maple, Pacific rhododendron, salal, red huckleberry	sword fern, Oregon oxalix, twin-flower
<b>Puget Sound Lowland</b>	hemlock	0-3,250'	60-120"	Douglas fir, western hemlock, western redcedar, red alder	vine maple, Pacific rhododendron, salal, red huckleberry	sword fern, Oregon oxalix, twin-flower
<b>Cascade Mountain Range</b>	hemlock	0-3,250'	60-120"	Douglas fir, western hemlock, western redcedar, red alder	vine maple, Pacific rhododendron, salal, red huckleberry, Pacific Madrone	sword fern, Oregon oxalix, twin-flower
	subalpine	2,000-7,250'	no data	mountain hemlock, noble fir, Shasta red fir, Pacific silver fir, western white pine	huckleberry species, rhododendron, dogwood, gooseberry, several blackberries	beargrass evergreen, violet hawkweed
	Douglas fir Grand fir	no data	no data	Douglas fir, ponderosa pine, western larch, lodgepole pine	kinnickinnick ceanothus	elk sedge, pine grass

**TABLE 27**  
continued

Physiographic Province	Vegetative Zone	Elevation Range	Average Precipitation	Major Tree Species	Dominant Shrub Communities	Grass, Forb or Herbaceous
<b>Cascade Mountain Range</b>	ponderosa pine/lodgepole pine	no data	14-30"	Douglas fir, ponderosa pine, western larch, lodgepole pine	nine bark, bitterbrush, sagebrush	Idaho fescue, blue bunch, wheat grass, pine grass, June grass, elk sedge
<b>Okanogan Highlands</b>	subalpine	2,000-7,250'	no data	mountain hemlock, noble fir, Shasta red fir, Pacific silver fir, western white pine	huckleberry species, rhododendron, dogwood, gooseberry, several blackberries	beargrass evergreen, violet hawkweed
	Douglas fir/Grand fir	no data	no data	Douglas fir, ponderosa pine, western larch, lodgepole pine	kinnickinnick, ceanothus	elk sedge, pine grass
	ponderosa pine/lodgepole pine	no data	14-30"	Douglas fir, ponderosa pine, western larch, lodgepole pine	nine bark, bitterbrush, sagebrush	Idaho fescue, blue bunch, wheat grass, pine grass, June grass, elk sedge
<b>Blue Mountains</b>	subalpine	2,000-7,250'	no data	mountain hemlock, noble fir, Shasta red fir, Pacific silver fir, western white pine	huckleberry species, rhododendron, dogwood, gooseberry, several blackberries	beargrass evergreen, violet hawkweed
	Douglas fir/Grand fir	no data	no data	Douglas fir, ponderosa pine, western larch, lodgepole pine	kinnickinnick, ceanothus	elk sedge, pine grass
	ponderosa pine/lodgepole pine	no data	14-30"	Douglas fir, ponderosa pine, western larch, lodgepole pine	nine bark, bitterbrush, sagebrush	Idaho fescue, blue bunch, wheat grass, pine grass, June grass, elk sedge
	ponderosa pine/western juniper	2,470-4,500'	8-12"	western juniper, ponderosa pine	big sagebrush, bitterbrush, gray & green rabbitbrush	blue bunch, wheat grass, Idaho fescue
	sagebrush/grass	no data	6-12"	no data	big sagebrush, bitterbrush	blue bunch, wheat grass, Idaho fescue, giant wildrye
<b>Columbia Basin</b>	sagebrush/grass	no data	6-12"	no data	big sagebrush, bitterbrush	blue bunch, wheat grass, Idaho fescue, giant wildrye

Source: U.S. Forest Service

A version of the Western hemlock zone occurs east of the Cascade Range. Extensive stands of Western hemlock and western red cedar occur in moist pockets and along streams and rivers throughout northeastern Washington, as well as farther east. The trees, understory vegetation and high precipitation give these inland stands a distinct maritime flavor.

c. Silver Fir Zone

The Silver fir zone extends from about 2,000 to 4,000 feet in Washington. On the west side of the Cascades, it abuts the Western hemlock zone at lower elevation and extends upward to subalpine forests in the Olympic and Cascade Mountains. Silver fir community types are also found east of the Cascades. The climate is cool and wet, with a short growing season. Considerable precipitation falls as snow and persists as winter snowpack for three to seven months. Dense forests consist of tall conifers and patches of shrubby undergrowth.

Huckleberry species are common. Douglas-fir is also a major component of this zone. Suitability of Douglas-fir as a replacement species after harvest will vary with the site.

d. Subalpine Fir/Mountain Hemlock Zone

Subalpine fir/mountain hemlock forests comprise the highest forest zone in Western Washington. They occur in the Olympics and on both sides of the Cascade Mountains, extending from about 4,000 feet to timberline. Mountain hemlock predominates at the lower limits and is replaced with subalpine fir at higher elevation. The zone finally ends in a mosaic of glades and meadows at high altitudes.

East of the Cascades and in the Okanogan Highlands Province, subalpine fir is found associated with Engelmann spruce. Mountain hemlock, however, reappears at high elevation in extreme northeastern Washington and farther inland.

Scattered pockets of Engelmann spruce are found on the eastside of the Olympics and west of the Cascades in the Mt. Baker-Ross Lake area. This is the coolest and wettest forest environment. Low temperatures make this zone different from other moist forest zones. Forests here are dense and contain short to medium-tall conifers, often with an understory mixture of shrub and herbaceous vegetation.

e. Alpine Zone

Alpine meadows and high-altitude barrens are found in the Olympics and Cascades above timberlines. This zone lacks timber production potential. Vegetation consists of rich and complex mixtures of forbs, grasses, sedges and low shrubs. Several types of plant communities on Washington alpine lands exist in response to local microclimatic variations of moisture, snowpack duration and substrate. Winters are cold and long, and summers are brief. Growth, except for spectacular floral displays, is slow.

f. Grand Fir Zone

An extensive, Grand fir zone occurs below the subalpine forest in Eastern Washington. From a management point of view, the Grand fir zone and Douglas-fir zone with which it merges are usually considered together; in an ecological sense, however, they should be considered separately.

Temperature and moisture conditions are not extreme. The zone is cooler and more moist than the lower Douglas fir zone but warmer, with less snow accumulation, than subalpine forests.

g. Douglas-fir Zone

The Douglas-fir zone in Eastern Washington is particularly dominant in the northern portion of the state and into British Columbia. Douglas fir in Washington is usually but not always bordered at lower and drier elevations by a band of ponderosa pine that separates it from shrub steppe and grass communities of the Columbia Basin.

Subtle limitations of temperature and moisture are probably important in separating the Douglas-fir zone from the more moist grand fir zone and the drier ponderosa pine zone. Forests in both the grand fir and Douglas-fir zones consist of dense medium and tall conifers. Where overstory density permits, understory vegetation may be of extensive brush or grass, depending on soil moisture content.

h. Ponderosa Pine Zone

The Ponderosa pine zone, lowest of the forest zones in Eastern Washington, occurs between 2,000 to 4,000 feet. On the Cascade slopes, it forms a narrow band with extensive tracts in the Okanogan Highlands and the Blue Mountain Provinces. The ponderosa pine usually borders the shrub-grassland zone but in south central Washington, a community of Oregon white oak is located between the two.



The climate is the driest of the Washington forest zones. Precipitation is low, especially in summer. Winters are cold with snow accumulation. Summer days are hot and summer nights cool. The effective growing season is short and probably moisture-limited. Soil moisture is important in controlling distribution of understory vegetation, which ranges from brush to grass. The forest consists of dense to open stands of tall trees. There is often a park-like appearance.

#### i. Shrub-Steppe and Steppe Zones

Two nonforested vegetation zones, shrub-steppe and steppe, occupy the Columbia Basin Province and extend into the lower mountain slopes of the Cascades, Okanogan Highlands and Blue Mountain Provinces. The shrub-steppe zone includes treeless vegetation of Eastern Washington and Oregon, with big sagebrush as a conspicuous element.

Several perennial native and introduced grasses and forbs constitute the remaining vegetation. This zone occupies the driest and hottest portion of the semi-arid to arid land area in the rain shadow of the Cascades. The steppe zone is similar to the shrub-steppe zone except that big sagebrush is missing. It occupies the easternmost part of the Columbia Basin and some mountain slopes as well.

#### 7.4.1.2 Endangered, Threatened and Sensitive Species of Flora

There are no federally-listed endangered or threatened floral species in Washington State. There are, however, some federal candidate plants that occur in the state. Candidates are species of concern that may be listed after further study.

The Washington Natural Heritage program, which is administered by the department's Land and Water Conservation Division, publishes lists of special species of flora in Washington. The Heritage Program also publishes a list of all Natural Area Preserves and the priorities for special plants and communities. Mapping of rare plant locations shows that several areas support high concentrations of rare plants. These areas include the Olympic Mountains, Mt. Rainier, the Wenatchee Mountains, the Columbia River Gorge and the Columbia Basin.

#### 7.4.2 Fauna

##### 7.4.2.1 Numbers and Diversity of Species

Washington contains a large variety of terrestrial and aquatic animal life. More than 350 species of land vertebrates are found in the state. Many fish species and other aquatic organisms inhabit state waters, and a wide variety of insects and microfauna are found in its air and soil. Riparian areas provide important habitats for large number of species.

The distribution of animal species is a product of climate, geology, resulting vegetation and the ability of species to adapt to changing conditions. Distribution patterns, however, are rarely stable. Many animals expand or contract their ranges in response to continued climatic changes, competition with other species, and natural or human alterations of their habitats.

Because food and cover are provided in large part by vegetation, fauna are often categorized by their floral habitat. The differences in fauna parallel the major climatic and floral differences for the two sides of the state: the lush, temperate, coniferous forests of Western Washington versus the drier, more open Rocky Mountain-forest types in Eastern Washington.

**Table 28** shows the primary wildlife species of mammals, birds, amphibians and reptiles found in the vegetative zones of Washington State. Common to all these zones are also various fish species. This table, compiled by the U.S. Forest Service, is meant to illustrate the variety of wildlife found in Washington State, and is not intended to be a complete list.

Some animal species are represented in all seven physiographic provinces and even in all vegetative zones, while others with more specific habitat requirements are found in only one or two zones. Representatives of most terrestrial wildlife families are generally found on state forest lands, but the numbers of indigenous mammals, birds, reptiles and amphibians vary annually and seasonally.

The more diverse the plant population, the more diverse the animals found in the area. If the composition or structure of the plant community is changed, some animal species benefit while others suffer. When the vegetative community changes, either from human activities or natural events (such as wildfire or landslides), one of three things happens to animals: 1) they adapt to the new plant community; 2) they leave the area; or 3) they perish. Those leaving must find suitable habitat.